Four Years of CERES/Terra ERBE-like TOA Fluxes

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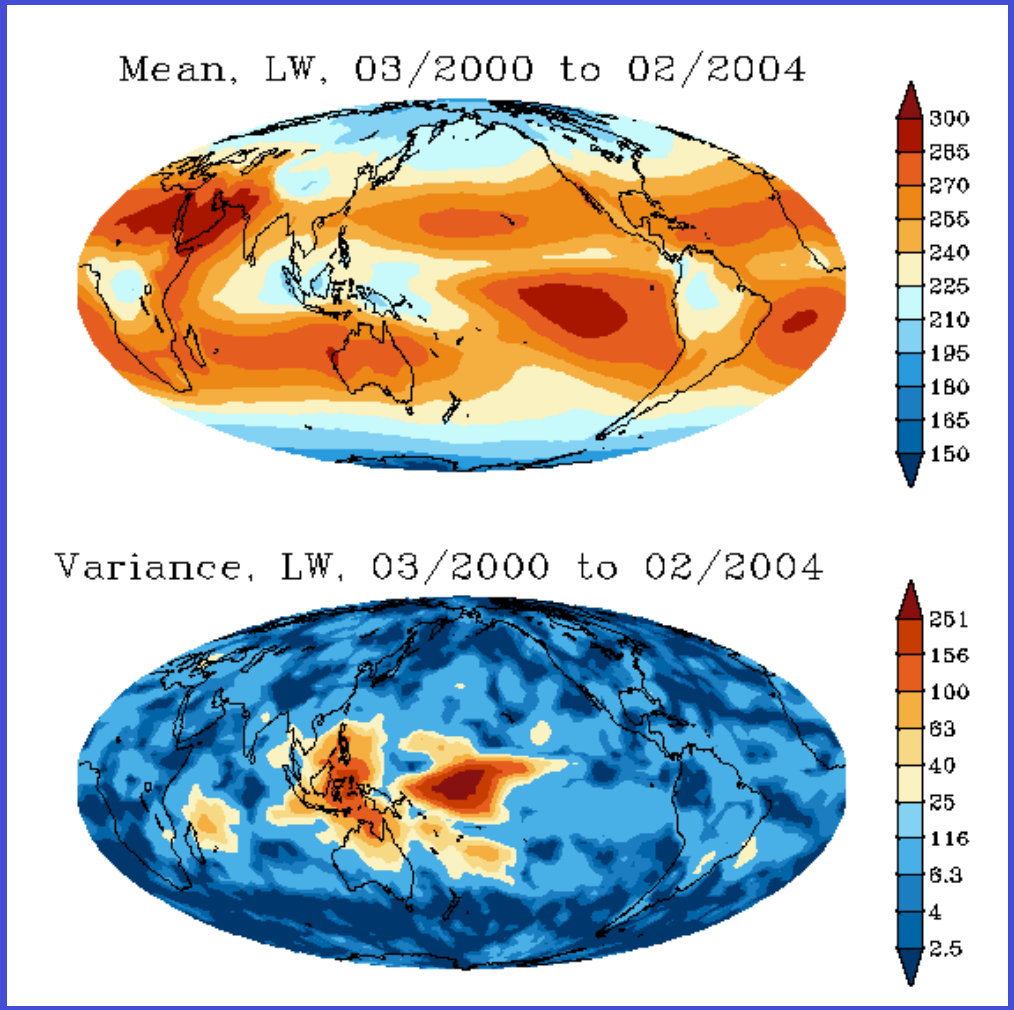
Objectives

- Examine first four years of CERES/Terra ERBE-like TOA fluxes (CERES/Terra ES-4 Data)
  - Mean and interannual variability (variability hot spots)
  - Time series of de-seasonalized TOA fluxes (trends/problems??)

Part I: CERES/Terra Four-Year Mean and Interannual Variability

- Compute annual mean for each of the four Terra years on regional, global, and tropical scale
- Calculate mean and interannual variability using these annual mean fluxes

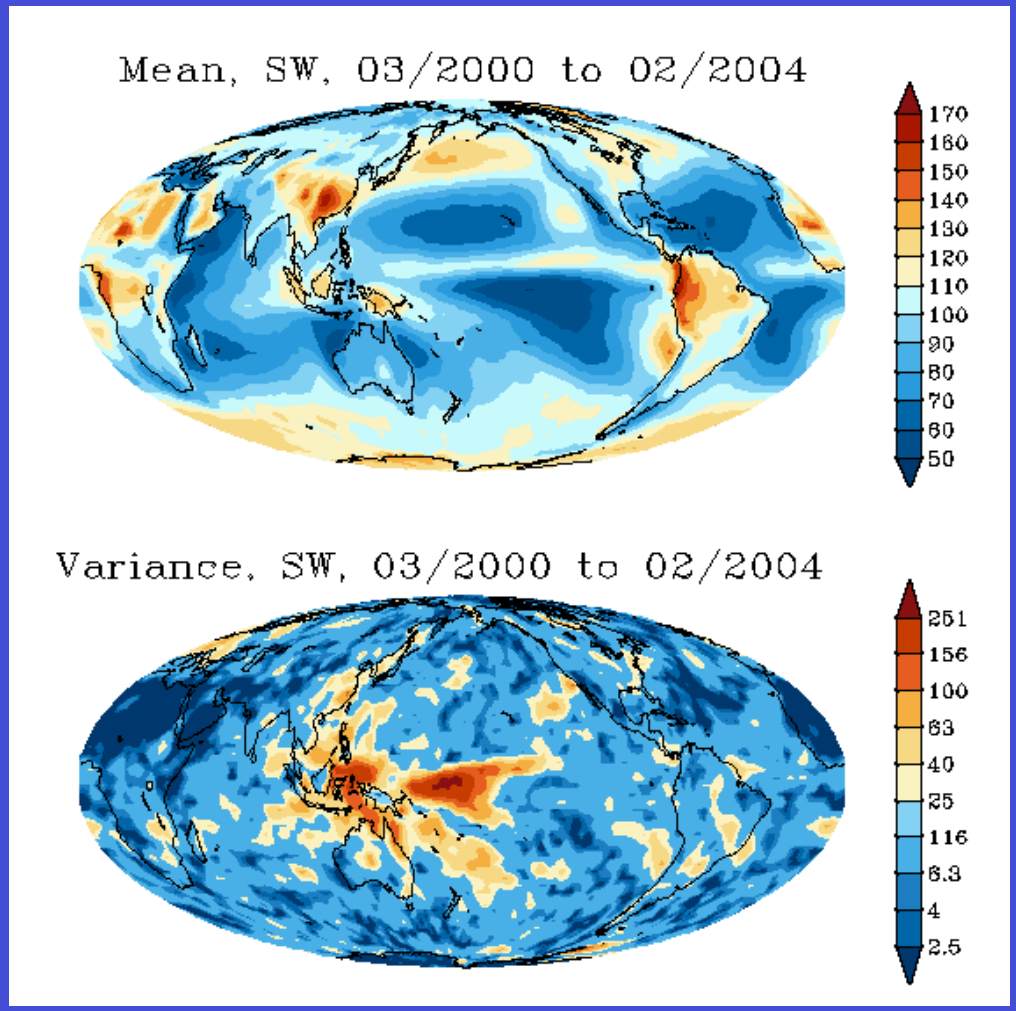
Mean and Interannual Variability: LW



Mean = 239.0 Wm^{-2}

Sigma = 0.46 Wm^{-2}

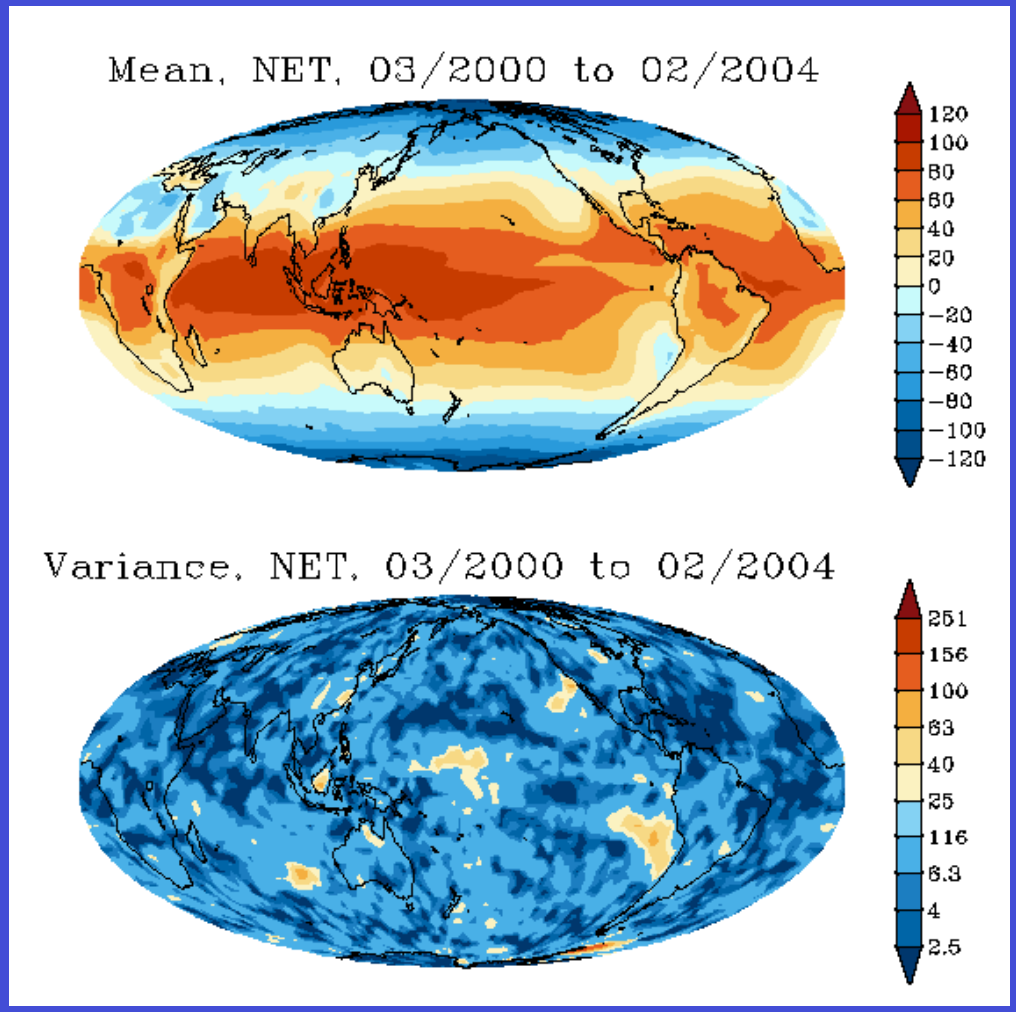
Mean and Interannual Variability: SW



Mean = 97.6 Wm^{-2}

Sigma = 0.95 Wm^{-2}

Mean and Interannual Variability: Net



Mean = 4.7 Wm^{-2}

Sigma = 0.50 Wm^{-2}

4-yr Terra Global/Tropical Mean/Statistics

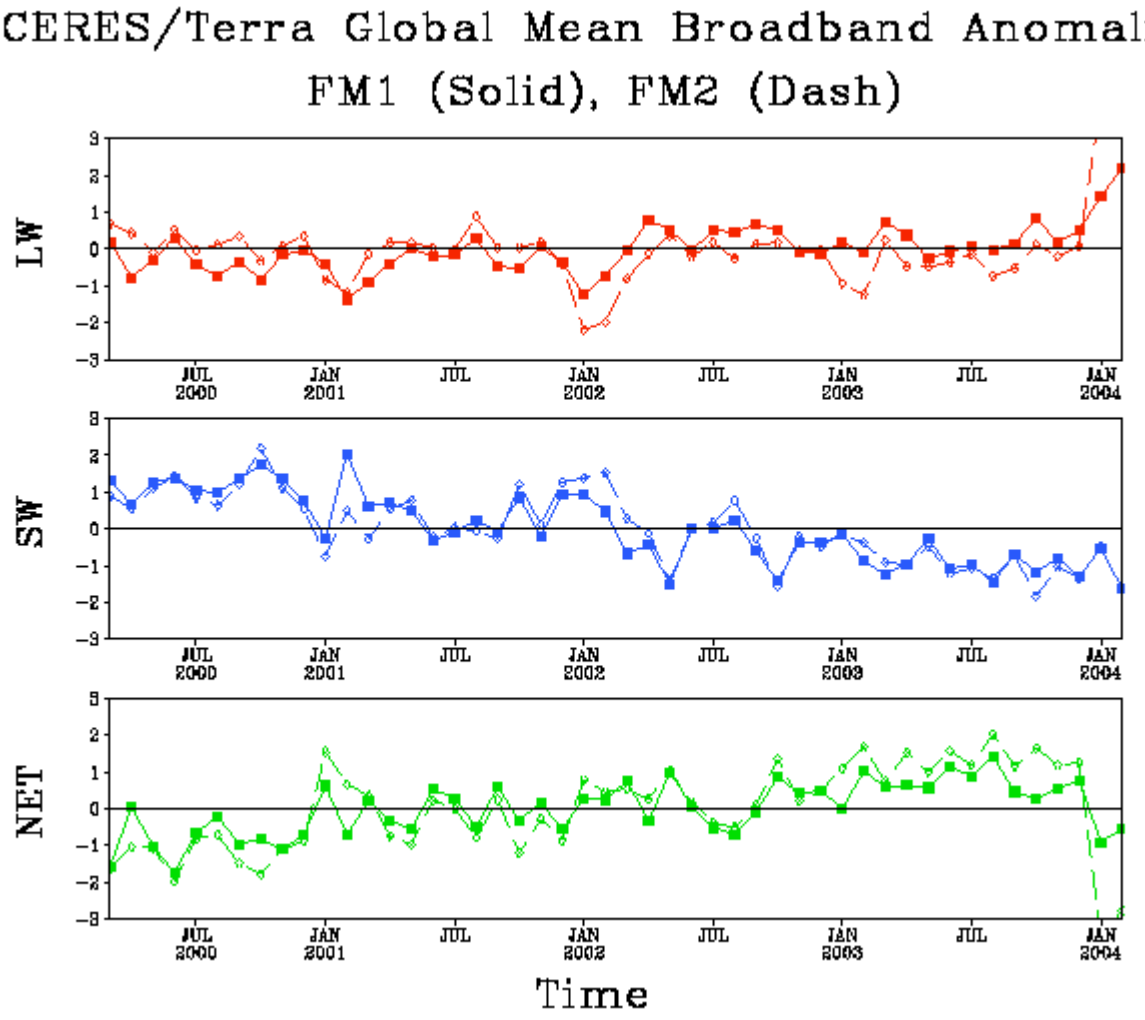
Globe (90N-90S)	All-sky Mean	Interannual Variability	Clear-sky Mean	Interannual Variability
LW	239.0	0.46	267.0	0.08
SW	97.6	0.95	48.8	0.30
Net	4.7	0.50	28.8	0.38

Tropics (30N-30S)	All-sky Mean	Interannual Variability	Clear-sky Mean	Interannual Variability
LW	259.4	0.75	287.6	0.18
SW	89.9	1.20	47.6	0.24
Net	51.2	0.50	64.8	0.21

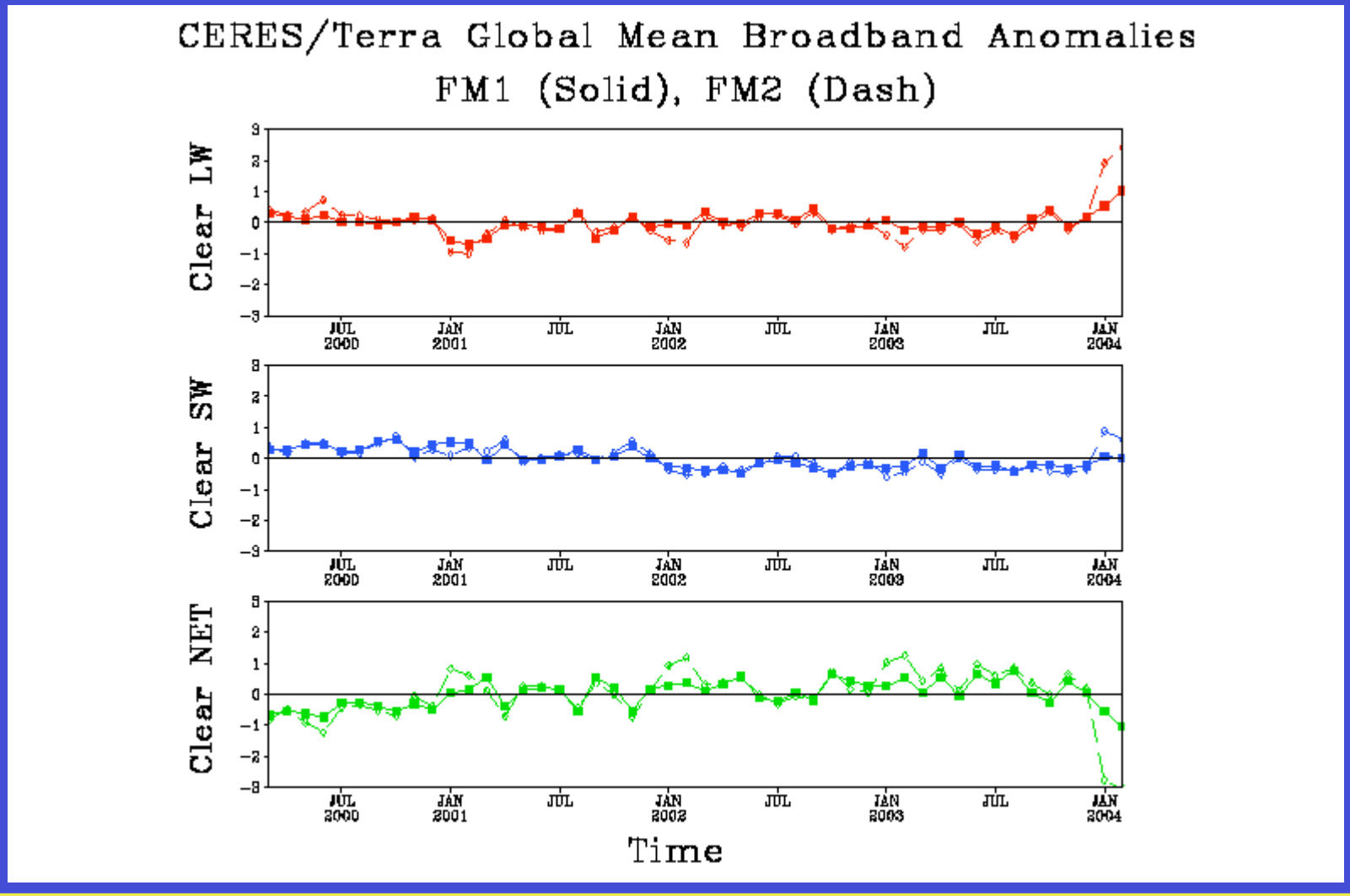
Part II: Time Series of CERES/Terra De-seasonalized Fluxes

- Compute 4-year mean for each of 12 calendar months for large area averages (globe, tropics, mid-latitudes, polar regions)
- Form de-seasonalized fluxes by subracting each of the 4-year means from the actual calendar month fluxes

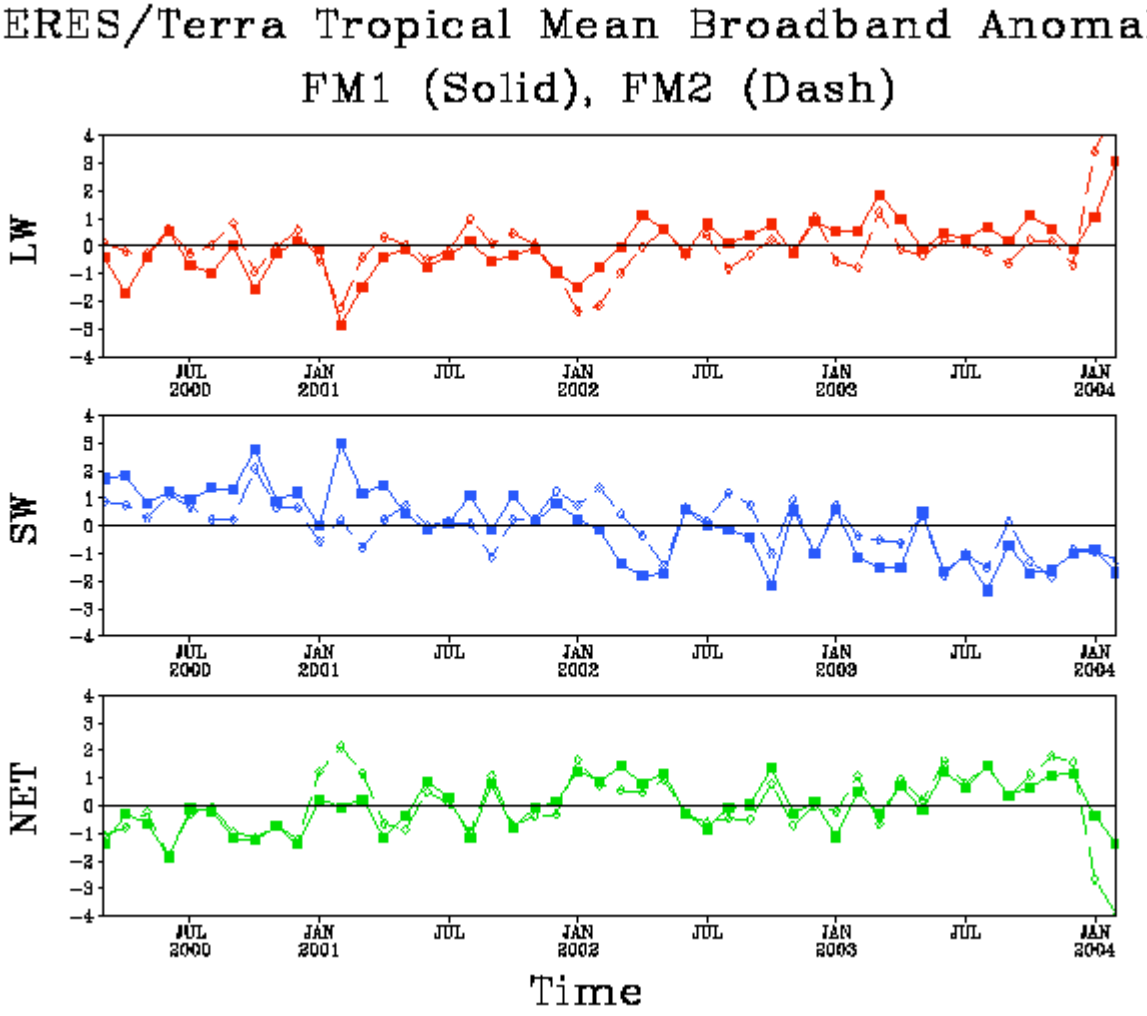
All-sky Global Mean De-seasonalize Fluxes



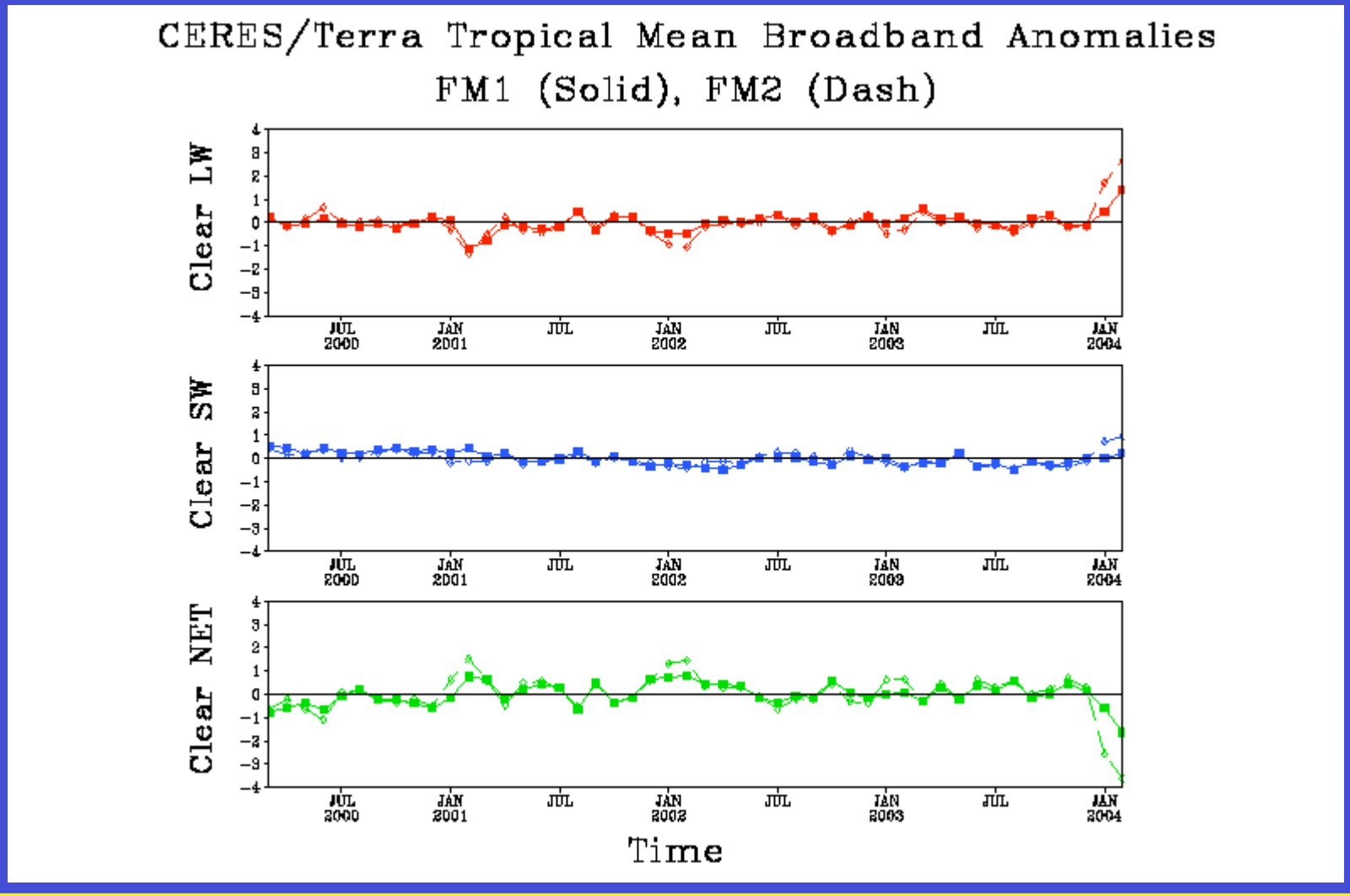
Clear-sky Global Mean De-seasonalized Fluxes



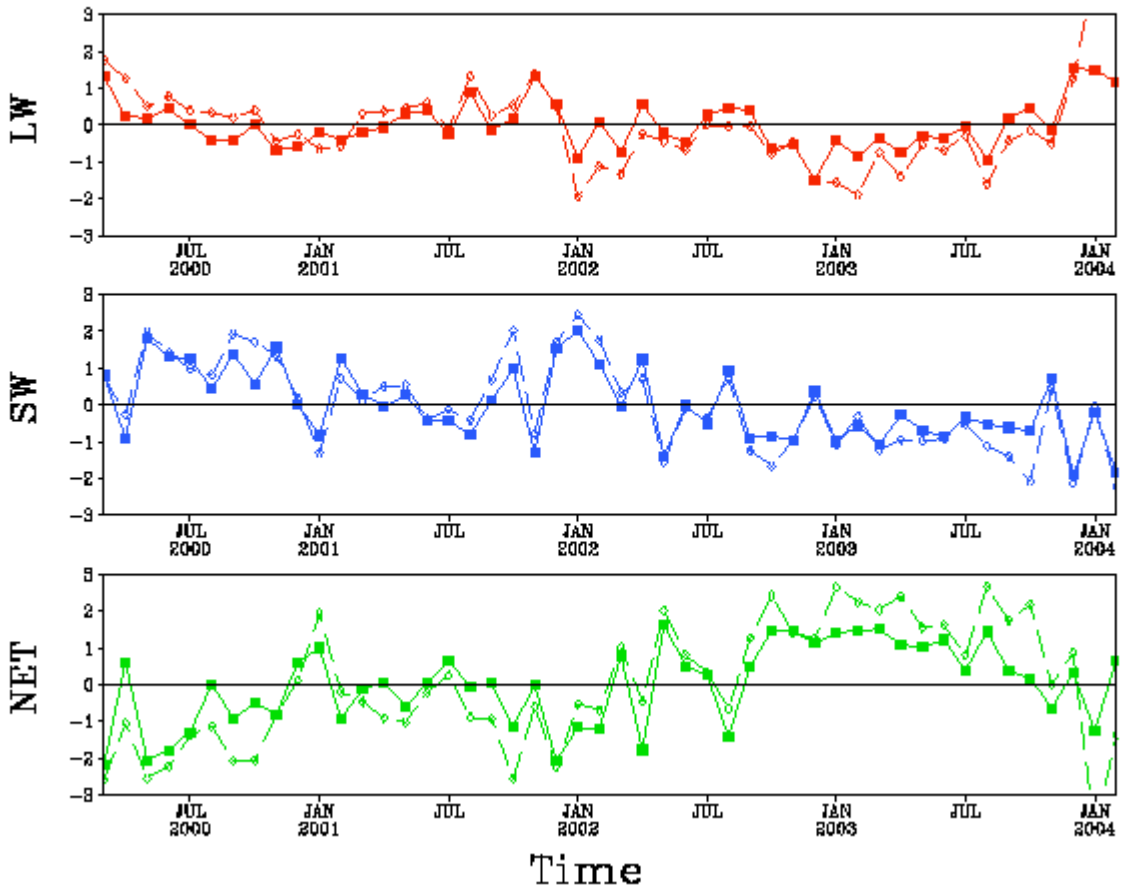
All-sky Tropical Mean De-seasonalized Fluxes



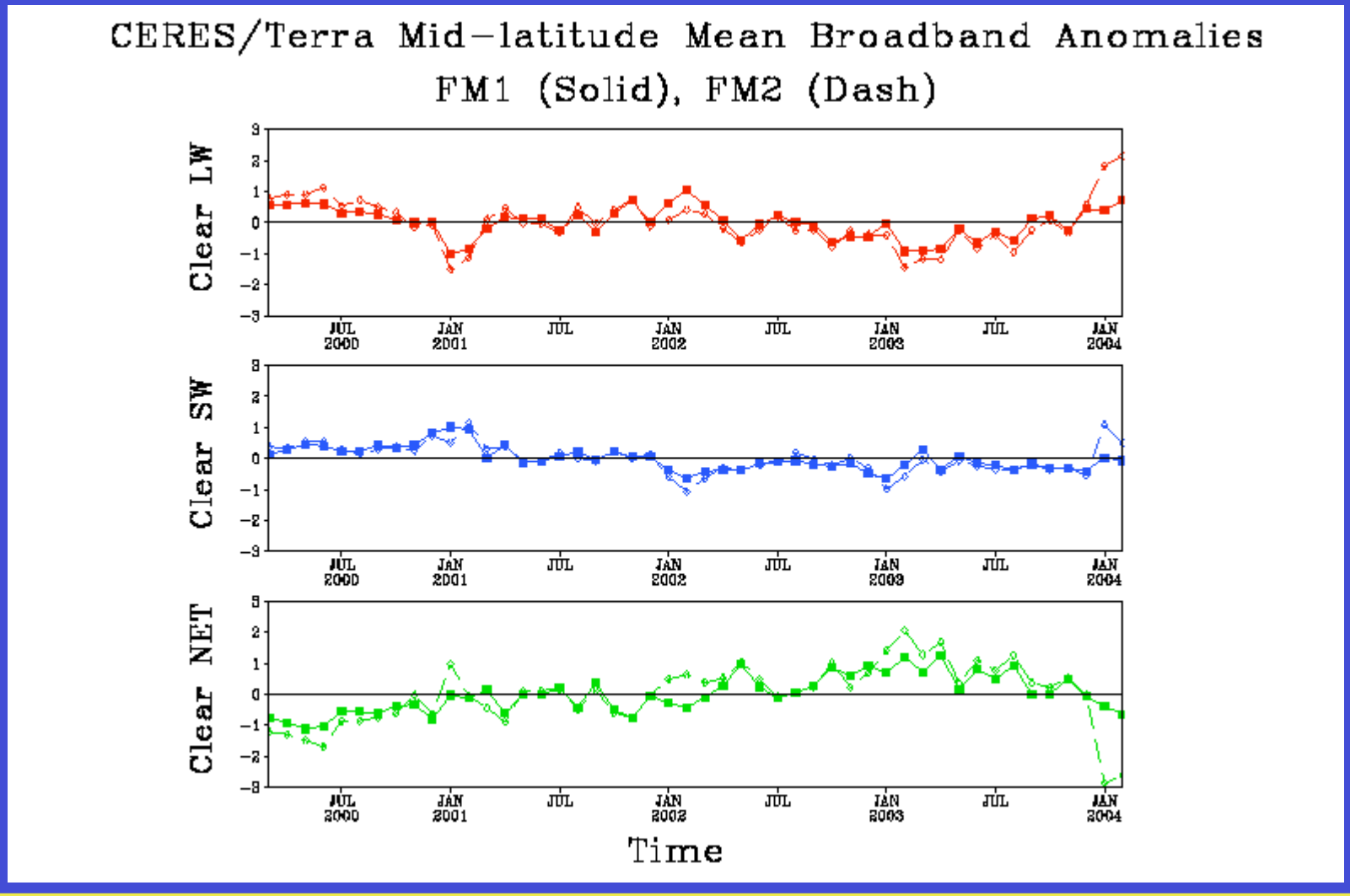
Clear-sky Tropical Mean De-seasonalized Fluxes



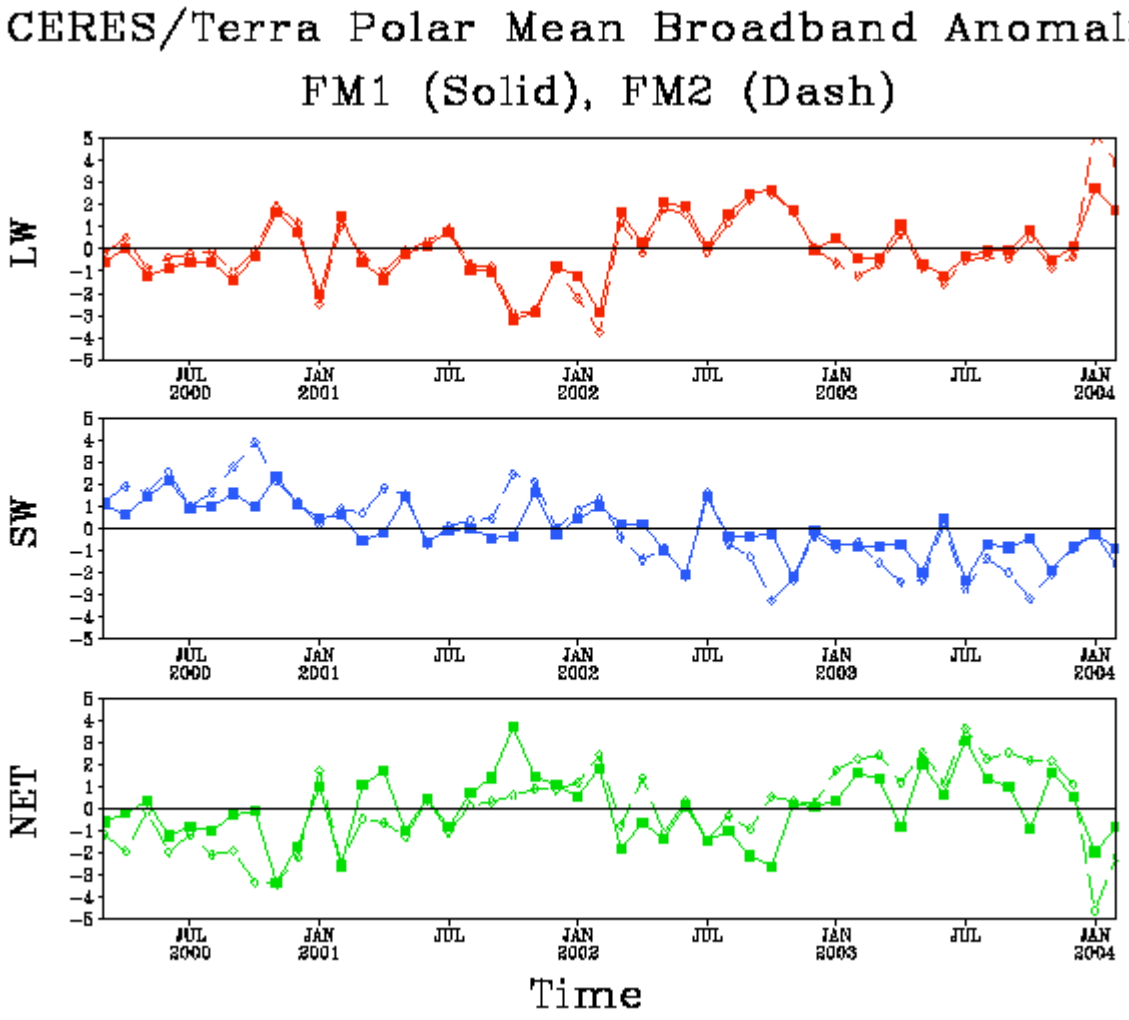
All-sky Mid-Latitude Mean De-seasonalized Fluxes



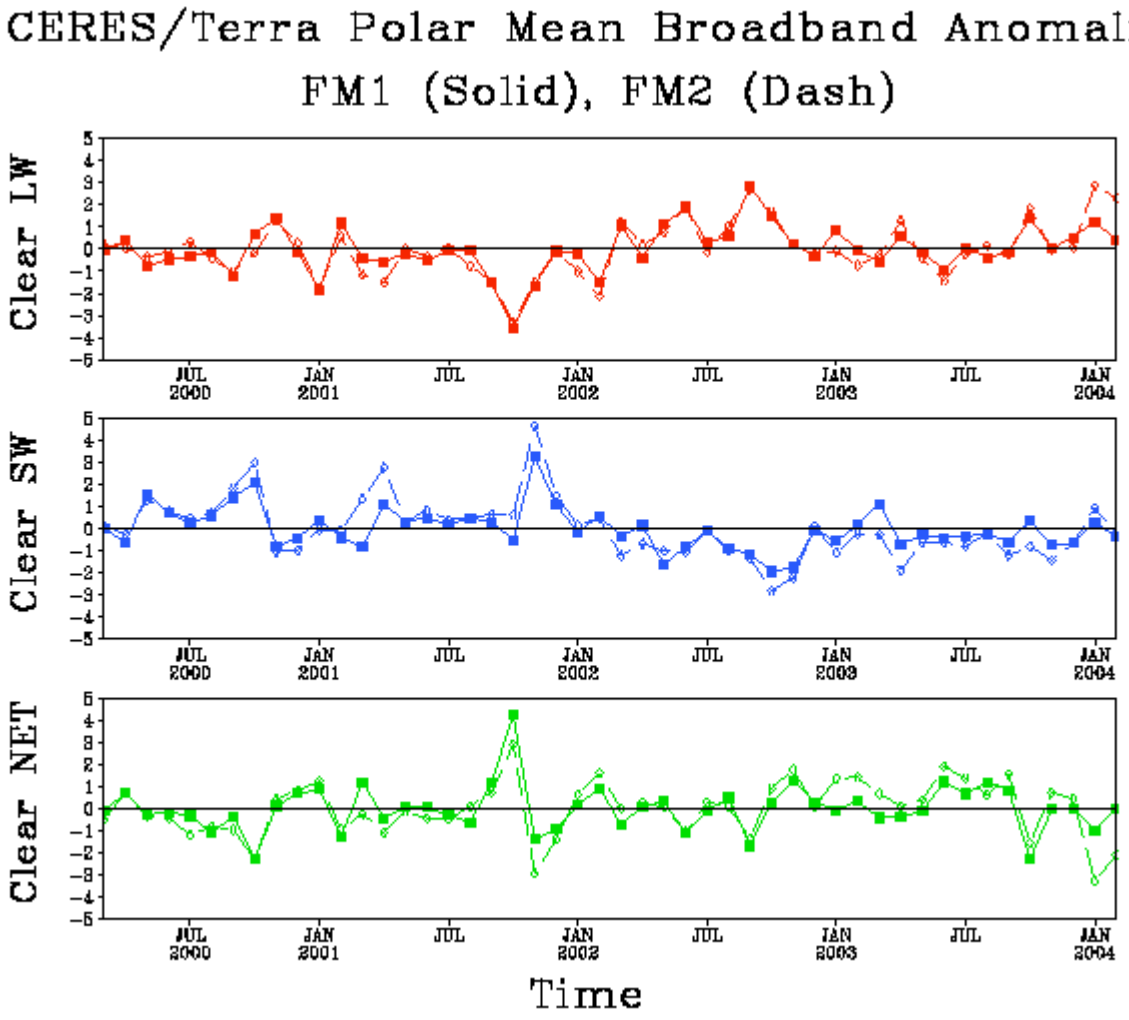
Clear-sky Mid-latitude Mean De-seasonalized Fluxes



All-sky polar Mean De-seasonalized Fluxes



Clear-sky Polar Mean De-seasonalized Fluxes



Summary

- Four years of CERES/Terra ERBE-like data show many interesting 2.5 degree regions with high level of interannual variability in longwave and shortwave fluxes
- Due to the cancellation nature of longwave and shortwave fluxes, regional interannual variability of net flux is smaller than those of longwave or shortwave flux
- Time histories of ERBE-like large area averaged fluxes over the four years period indicate a decreasing trend in shortwave flux for both FM1 and FM2 instruments (~2% in all-sky and <1% in clear-sky over four years)
- N. Loeb and T. Charlock will explain what this mean (real signal or possible instrument problem) using New CERES data